

EXPERIMENTAL CORRELATION OF MELT STRUCTURES, NUCLEATION RATES,
AND THERMAL HISTORIES OF SILICATE MELTS

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The theory and measurement of the structure of liquids is an important aspect of modern metallurgy and igneous petrology. Liquid structure exerts strong controls on both the types of crystals that may precipitate from melts and on the chemical composition of those crystals. An interesting aspect of melt structure studies is the problem of melt "memories"; that is, a melt can retain a memory of previous thermal history. This memory can influence both nucleation behavior and crystal composition.

This melt memory may be characterized quantitatively with techniques such as Raman, infrared and NMR spectroscopy to provide information on short-range structure. Melt structure studies at high temperature will take advantage of the microgravity conditions of the Space Station to perform containerless experiments. Melt structure determinations at high temperature (experiments that are greatly facilitated by containerless technology) will provide invaluable information for materials science, glass technology and geochemistry. In conjunction with studies of nucleation behavior and nucleation rates, information relevant to nucleation in magma chambers in

terrestrial planets will be acquired.